

name: _____

MCF3M - Quiz #2: Exponents and Exponential Functions /31

1. Identify the following as linear, quadratic, exponential. [3]

(Hint: use first and second differences and ratio of first difference)

x	y	1st	2nd
-2	8		
-1	2	-6	
0	0	-2	4
1	2	2	4
2	8	6	4

quadratic

x	y	1st
-2	25	-5
-1	20	-5
0	15	-5
1	10	-5
2	5	-5

linear

x	y	Multiplication pattern
-2	0.04	5
-1	0.2	5
0	1	5
1	5	5
2	25	5

exponential

2. Determine an equation for each exponential function described below. [4]

a)

Initial value

x	y
0	500.0
1	600.0
2	720.0
3	864.0
4	1036.8

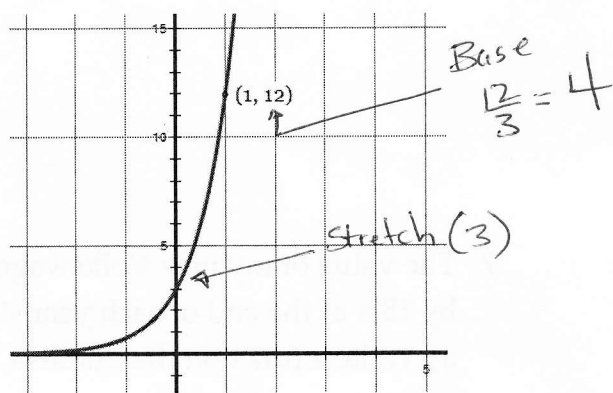
Ratio

$$\frac{120}{100} = 1.2$$

Equation

$$y = 500(1.2)^x$$

b)



$$y = 3(4)^x$$

3. a) Give an example of an exponential function representing growth using an equation. [1]

$$f(x) = 3^x$$

- b) Give an example of an exponential function representing decay using an equation. [1]

$$f(x) = 0.3^x$$

4. Evaluate. (leave answers in fractional form) [4]

a) -2^6

$= -64$

b) $(-3)^0$

$= 1$

c) $\left(\frac{2}{3}\right)^4$

$= \frac{16}{81}$

d) $78125^{\frac{2}{7}}$

$= 25$

$$= \left(\sqrt[7]{78125}\right)^2 = 5^2 = 25$$

5. Simplify (express answers as fractions with pos exponents only) [8]

$$\begin{aligned} \text{a) } (7^3)^{-5} \\ = 7^{-15} \\ = \frac{1}{7^{15}} \end{aligned}$$

$$\begin{aligned} \text{b) } \frac{5(5^{-4})}{5^7} \\ = 5^{1-4-7} \\ = 5^{-10} \\ = \frac{1}{5^{10}} \end{aligned}$$

$$\begin{aligned} \text{c) } \left(\frac{2x}{3}\right)^{-2} \\ = \left(\frac{3}{2x}\right)^2 \\ = \frac{3^2}{2^2 x^2} \\ = \frac{9}{4x^2} \end{aligned}$$

$$\begin{aligned} \text{d) } \left(\frac{4a^{-3}}{(a^3)^2}\right)^2 \\ = \left(\frac{4a^{-3}}{a^6}\right)^2 \\ = (4a^{-3-6})^2 \\ = (4a^{-9})^2 \\ = 4^2 a^{-18} \end{aligned}$$

$$\begin{aligned} &\rightarrow 16a^{-18} \\ &= 16\left(\frac{1}{a^{18}}\right) \\ &= \frac{16}{a^{18}} \end{aligned}$$

6. Evaluate without a calculator (show all steps for full marks) [3]

Aside

$$\begin{aligned} \sqrt[7]{(64^{\frac{1}{2}})(64^{\frac{2}{3}})} &= (64^{\frac{1}{2} + \frac{2}{3}})^{\frac{1}{7}} \\ &= (64^{\frac{7}{6}})^{\frac{1}{7}} \\ &= 64^{\frac{7}{42}} \\ &= 64^{\frac{1}{6}} \\ &= \sqrt[6]{64} \\ &= 2 \end{aligned}$$

7. The value of my new Volkswagon, V, was \$30 000 but it has depreciated in value by 15% at the end of each year since it was purchased.

a) Write a function that models the situation [1]

$$\begin{aligned} V(n) &= 30000(1 - 0.15)^n \\ &= 30000(0.85)^n \end{aligned}$$

b) What is the car's value at the end of 4 years? What is the car's value at the end of 5 years? [2]

$$\begin{aligned} V(4) &= 15660.19 \\ V(5) &= 13311.16 \end{aligned}$$

c) What value did the car lose during the 5th year? [1]

$$\begin{aligned} &= 15660.19 - 13311.16 \\ &= 2349.03 \end{aligned}$$

\therefore it lost \$2349.03

d) When will the car be worth \$6948.50? [3]

$$\frac{6948.50}{30000} = \frac{30000(0.85)^n}{30000}$$

$$0.232 = (0.85)^n$$

then

$$\begin{aligned} n &= \frac{\log 0.232}{\log 0.85} \\ &= 9 \end{aligned}$$

\therefore at the end of 9 yrs